the natural food-plant, were shown by Mr. J. A. Simes, Mr. A. Quail, and Mr. A. J. Croker, the latter gentleman's *Phorodesma smaragdaria* being especially noticeable. Mr. R. Adkin exhibited a collection of British Sphinges and Bombyces, arranged with a view to showing local variation, such variation being well defined in some of the species of the genus *Spilosoma.* Also a collection of Macro-Lepidoptera made at Rannoch, Perthshire, in 1891, illustrating an article on the local variation prevailing in that district recently contributed to the *Entomologist.* Mr. Tutt, extremely long and variable series of Noctuæ. Mr. Machin four drawers from his cabinet; among the rarer species were *Dicranura bicuspis* and *Drepana sicula.*

In the third room there was a large exhibit of marine Mollusca, by Mr. Conisbee. Mr. Step's exhibit of living Mollusca afforded a capital opportunity for comparing the mollusks as well as their shells. Between thirty and forty species were thus shown, each in a separate glass, and ranged from the substantial *Helix pomatia* to the graceful *Clausilia rugosa* among land snails; and from the large *Anodons* to the fragile *Planorbis linentus* among the aquatic species. Pond life was shown by Mr. Perks; living newts, &c., by Mr. R. Adkin, Jun.; and living snakes, &c., by Mr. Gee. A gigantic sponge was exhibited by Mr. Kedgley.

In a fourth room Mr. Reeves exhibited and explained an original set of diagrams, showing the correct positions of horses' legs while walking, trotting, and galloping, and to demonstrate their correctness the diagrams were transferred to a zoëtrope.

A large room was set apart for lectures, and during each evening crowded audiences listened to Mr. F. Enock, who lectured on "The Life-history of the British Trap-door Spider." The lecture was illustrated by Mr. Enock's original microphotographic slides, shown by means of the oxy-hydrogen lantern. Mr. E. Step's "Talk about Toadstools" was listened to attentively on each evening. The figures thrown on the screen were from Mr. Step's own photographs and drawings. A third lecture was given by Mr. George Day, illustrated by microphotographic slides, entitled "Domestic Friends and Foes."

IMÈRINA, THE CENTRAL PROVINCE OF MADAGASCAR.

ON Monday evening the Rev. James Sibree read a valuable paper on Imèrina, the central province of Madagascar, before the Royal Geographical Society. After an account of the work of recent explorers, of whom the French surveyors, MM. Catat and Maistre, and the English missionary, Mr. Baron, are the most important, Mr. Sibree came to the main subject of his paper, of which the following is an abstract.

M. Grandidier, who is now completing a splendid atlas of Madagascar, published a map of Imèrina on the scale of 1 : 200,000 in 1880, and in 1883 an orographical map coloured according to the contour lines. The road from the port of Tamatave to Antananarivo, the Hova capital, in the centre of the Imèrina province remains a mere footpath, impassable either to wheeled vehicles or to beasts of burden; and now, as 300 years ago, porters are the only means of transport.

Imèrina ("the elevated") is bounded on the east by the steep ridge of forest-girdled mountain sloping to the Indian Ocean. The other boundaries are indistinct, and the total area of the province may be estimated at 7000 square miles. The general level of the province is from 4000 to 4500 feet above the sea. It is a mountainous region, abounding in peaks, which rise high above the breezy plateau, and marked also by many valleys. The most prominent summits are Angàvokèly to the east, Ambòhimiangàra in the extreme west, Ihàranandriàna to the south, Milangàna, Ambòhimanòa, and Andrìngitra more central, and Ambòhipanìry and Vòhilèna to the north. The south-west of the province is dominated by the central mass of Ankàratra, a denuded volcano of great size, its peaks forming the culminating points of the island, and reaching nearly 9000 feet above the sea. The mountain-peaks are usually granite or gneiss, sometimes occurring in great rounded bosses, sometimes in fantastically carved pinnacles resembling from a distance Titanic forts, castles, and cathedrals. Decomposed granite covers a great part of the country with thick deposits of clay, sometimes white but more often tinted deep red by ferric oxide. Iron is abundant, gold has recently been discovered, graphite, galena, copper, and other useful minerals are also found in Imèrina. The watershed of the island lies much nearer the east coast than the west, and the two chief rivers rising in the extreme east traverse the breadth of the province on their way to the Mozambique Channel. The Ikòpa, fed by the Sisaony, the Andròmba, the Màmba, and other streams, flows north-westward through the fertile plain of Bètsimitàtatra, and farther north is joined by the Bètsibòka, under which name the united stream runs on to the sea at the Bay of Bembatòka. Lake Itàsy is the only large body of water in Imèrina, and probably owes its origin to volcanic subsidence.

On account of its altitude Imèrina has a pleasant temperate climate, although lying within the tropics. The south-east trade-winds, blowing fresh and moist over the forest belt and the wooded plains of the east, make the atmosphere peculiarly bracing in the cooler season. The annual rainfall at Antananarivo is about 53 inches. Through the clear pure air distant landscapes stand out with remarkable sharpness of outline. Towards sunset Imèrina is seen in its most attractive aspect; the hills, range beyond range, assume the richest shades of purple, the sky flames with crimson and gold, and the long clay walls of the native compounds glow like streaks of vermilion.

The general aspect of the province is bare, except for patches of primæval forest in the northern districts. Moor-like hills, which would look utterly dreary but for the marvellous atmospheric effects, predominate. Near Antananarivo the dried-up bed of an ancient lake, known as Bètsimitàtatra, forms a great plain, covered with rice-fields, which support a dense population. The steep sides of the river valleys are terraced, like great green staircases, with rice-plots, where the grain is sown broadcast, and whence the young plants are transplanted in the larger fields along the river-plains and in the meadows left by dried-up lakes.

The political subdivisions of Imèrina are mainly tribal, and are used for purposes of taxation, and for the apportionment of military levies and forced labour. No census has been taken, but an estimate based on the number of villages and houses justifies the estimate of the population at about 1,100,000. Except Antananarivo, there are only small villages in the province, but these are clustered very closely together, especially to the north and north-west of the capital. Several of these were formerly tribal capitals, and Ambòhimànga still retains nominal equality with Antananarivo in royal speeches. The old villages were always built on hills for purposes of defence, and surrounded by double or treble lines of fosses and embankments dug out of the hard red clay. A narrow bridge of the red clay leads to the gateway, which is formed of blocks of rock, either a circular slab 10 or 12 feet in diameter, which was rolled between upright gate-posts so as to block the way, or massive upright monoliths bearing strong wooden gates. In recent times the Hovas have largely deserted these fortresses, and built themselves villages close to the rice-fields. Graves of the aboriginal Vazimba are scattered over the province, but local feeling prevents any examination of these from being made.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, May 2.—M. d'Abbadie in the chair.—The movements of minute organisms analyzed by means of chronophotography, by M. Marey. Using an arrangement described in the *Revue Générale des Sciences* in November last, and in NATURE, vol. xlv. p. 228, M. Marey has obtained photographs of the movements of blood corpuscles in the capillaries, and has analyzed the movements of zoosphores in the cells of a Cladophora. Enlargements from these negatives have been presented to the Academy. By taking a series of pictures at intervals of about one-tenth of a second, and projecting them upon a screen at about the same rate, the effect of the real motions of the object can be reproduced. The arrangement for doing this will be described in a future communication.—Observations of Swift's, Denning's, and Winnecke's comets, made at Algiers Observatory with the *coudé* equatorial, by MM. Rambaud and Sy. Observations of position are given.—On the approximation of functions of very large numbers, by M. Maurice Hamy.—On the tautochronism in a material system, by M. Paul Appell.—On the laws of electrolysis, by M. A. Chassy. When a substance having the formula M_pR_q is electrolyzed, M designating an electro-positive and R an electro-negative radicle, one equivalent of the radicle R, and $\frac{p}{q}$ equivalents of the radicle M

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are disengaged when one equivalent of hydrogen is set free in a voltameter included in the circuit. Wiedemann and others have found exceptions to this law, for in the case of some salts, $\frac{q}{p}$ equivalent of the radicle R and one equivalent of the other radicle are disengaged. M. Chassy proposes to substitute the following law for those previously enunciated, all cases being included in it: "Lorsqu'on électrolyse une substance quelconque il se dégage toujours l'équivalent d'hydrogène ou la quantité correspondante du radical électropositif."—A new case of abnormal solution: saturated solutions, by M. F. Parmentier. The author finds that the solubility of ethyl bromide in ether decreases rapidly with increase of temperature.—The occurrence of fluorine in different varieties of natural phosphates, by M. Ad. Carnot. From the results of the analyses of a number of sedimentary phosphates it is concluded that in the sedimentary phosphates the proportion of fluorine is sensibly equal to that in apatites having an equal percentage of phosphorus. Phosphorites of fibrous, semi-crystalline structure have almost the same composition as crystallized apatites. Earthy or compact phosphorites contain a less proportion of fluorine. Concretionary, zoned, and mammillated phosphorites contain barely any fluorine.—Estimation of small quantities of carbon monoxide by means of cuprous chloride, by M. L. de Saint-Martin.—Thermal study of the value of the replacement of hydrogen in phenolic hydroxyl, by M. de Forcrand. C_6H_6O sol. + Na sol. = $C_6H_5 . ONa$ sol. + H gas . . . . + 39·10 cal. This is practically the mean value for the replacement of H by Na in tertiary alcohols and acids, for $\frac{27·89 + 50·17}{2} = + 39·03$.

On an ethylnitroketone and an acetylnitroketone derived from camphosulphophenols, by M. P. Cazeneuve.—Determination of the surface of ebullition of normal paraffins, by M. G. Hinrichs.—Action of pyridine bases on certain sulphites, by M. G. Denigès. Compounds of the type SO_3M'', C_5H_5N have been obtained and examined.—Preparation and physical properties of acetyl fluoride, by M. Maurice Meslans. (See Notes).—Diamidophenyl sulphone and some of its derivatives, by M. Ch. Lauth.—Colouring matters and azo and alkyl compounds derived from chrysaniline, by MM. A. Trillat and De Raczkowski.—On a soluble naphthol derivative, by M. Stackler.—Remarks on some fishes from Upper Tonkin, by M. Léon Vaillant.—On *Cerataspis petiti*, Guérin, and on the systematic position of the species *Cerataspis*, Gray (*Cryptopus*, Latreille), by MM. A. Giard and J. Bonnier.—On an embryological law for the orders *Rhabdocœlida* and *Triclada*, by M. Paul Hallez.—On the circulation of the blood in young spiders, by M. Marcel Causard.—On the discovery of *Bactryllium* in Meurthe-et-Moselle Trias, by MM. Bleicher and P. Fliche.—Applications to normal physiology and pathology of the temporary loss of the activity of tissues by local cocainisation, by M. C. A. François-Franck.—Observation of a meteor, by M. L. Simon (extract from a letter to M. Wolf). The meteor was observed on April 24, at 11h. 55m. in the evening. It moved from east to west at an altitude of about 70° or 80°.

DIARY OF SOCIETIES.

London.

THURSDAY, May 12.

Royal Society, at 4.30.—Transformers: Prof. Perry, F.R.S.—On the Probable Effect of the Limitation of the Number of Ordinary Fellows elected into the Royal Society, to Fifteen in each Year, on the Eventual Total Number of Fellows: General Strachey, F.R.S.—On the Shoulder-girdle in Ichthyosauria and Sauropterygia: J. W. Hulke, F.R.S.—On the Embryology of Augiopteris evecta (Hoffm.): J. B. Farmer.—Note on Excretion in Sponges: G. Bidder.—On the Development of the Stigmata in Ascidians: W. Garstang.

Mathematical Society, at 8.—On an Operator that produces all the Co-variants and Invariants of any System of Quantics: Dr. W. E. Story.—Applications of a Theory of Permutations in Circular Procession to the Theory of Numbers: Major MacMahon, F.R.S.

Institution of Electrical Engineers, at 8.—Notes on the Light of the Electric Arc: A. P. Trotter. (Discussion.)—On the Cause of the Changes of Electromotive Force in Secondary Batteries: Dr. J. H. Gladstone, F.R.S., and W. Hibbert.

Institution of Civil Engineers.—Students' Visits to the Beckton Gas Works, the Northern Outfall Sewer, the Victoria and Albert Docks, and the P. and O. s.s. *Oceana*. Leave Fenchurch Street at 9.18 a.m.

Royal Institution, at 3.—The Chemistry of Gases: Prof. Dewar, F.R.S.

FRIDAY, May 13.

Royal Astronomical Society, at 8.

Physical Society, at 5.—An Instrument for Drawing Parabolas: R. Inwards.—Some Electrical Instruments: F. H. Nalder.—An Instrument for Measuring Magnetic Fields: E. Edser and H. Stansfield.

Institution of Civil Engineers.—Students' Visits to Woolwich Arsenal, the Works of the London Electric Supply Corporation at Deptford, and the Tower Bridge. Leave Charing Cross at 9.40 a.m.——At 7.30.—Students' Annual Dinner at the Holborn Restaurant.

Royal Institution, at 9.—The New Star in Auriga: Dr. William Huggins, F.R.S.

Amateur Scientific Society, at 7.—Exhibition of Objects of interest.——At 8.—Recent Additions to Botanical Science: L. A. Boodle.—The Copper Production of North America: W. Semmons.

SATURDAY, May 14.

Royal Botanic Society, at 3.45.

Royal Institution, at 3.—J. S. Bach's Chamber Music (with many Musical Illustrations): E. Dannreuther.

MONDAY, May 16.

Victoria Institute, at 8.—On Primitive Man: Sir W. Dawson and Rev. J. Meilo.

TUESDAY, May 17.

Zoological Society, at 8.30.—On the Geographical Distribution of the Land-Mollusca of the Philippine Islands: Rev. A. H. Cooke.—Resultats des Recherches Ornithologiques faites au Pérou par M. Jean Kalinowski: Graf Hans von Berlepsch, C.M.Z.S., and M. Jean Stolzmann.—On Lucioperca marina: G. A. Boulenger.—On the Antelopes of the Genus Cephalophus: Oldfield Thomas.

Institution of Civil Engineers, at 8.—The Distribution and Measurement of Illumination: A. P. Trotter. (Discussion.)—The Measurement of High Temperatures: Prof. W. C. Roberts-Austen, F.R.S.

Royal Institution, at 3.—Photography in the Colours of Nature; Frederick E. Ives.

WEDNESDAY, May 18.

Royal Meteorological Society, at 7.—Results of a Comparison of Richard Anémo-Cinémographe with the Standard Beckley Anemograph at the Kew Observatory: G. M. Whipple.—Rain-drops: E. J. Lowe, F.R.S.—Levels of the River Vaal at Kimberley, South Africa, with Remarks on the Rainfall of the Watershed: W. B. Tripp.

Royal Microscopical Society, at 8.—On the Organs of Oviposition in certain Cattle Ticks: R. T. Lewis.—The Penetrating Power of the Microscope: E. M. Nelson.—The Rings and Brushes of Crystals: E. M. Nelson.

THURSDAY, May 19.

Royal Society, at 4.30.

Chemical Society, at 8.—Magnetic Rotation of some Acetyl Derivatives: W. H. Perkin, F.R.S.—Studies on Isomeric Changes, No. IV.; Halogen Derivatives of Quinone, Part I.: A. R. Ling.—Note on Diastatic Action: E. R. Moritz and T. A. Glendinning.—Formation of the Hydrocarbon $C_{18}H_{12}$ from Phenylpropionic Acid: Dr. Kipping.

Institution of Electrical Engineers, at 8.

Royal Institution, at 3.—The Chemistry of Gases: Prof. Dewar, F.R.S.

FRIDAY, May 20.

Royal Institution, at 9.—Electro-Metallurgy: J. Wilson Swan.

SATURDAY, May 21.

Royal Institution, at 3.—J. S. Bach's Chamber Music (with many Musical Illustrations): E. Dannreuther.

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